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A reassessment of *Cryptops loveridgei* Lawrence and *C. kivuensis* Lawrence, with observations on the subgenera *Trigonocryptops* Verhoeff and *Paratrigonocryptops* Demange (Chilopoda, Scolopendromorpha)

by

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ABSTRACT

Cryptops loveridgei Lawrence, 1953 from Tanzania and *Cryptops kivuensis* Lawrence, 1953 from the Democratic Republic of the Congo belong not to the subgenus *Cryptops* Leach, 1815, but to the subgenus *Trigonocryptops* Verhoeff, 1906. These species are redescribed in detail. *C.* (*Trigonocryptops*) *bokumensis* Kraus, 1958 is a junior synonym of *C. loveridgei.* The subgenus *Paratrigonocryptops* is a junior synonym of *Trigonocryptops.* The two species and two subspecies of *Paratrigonocryptops* thus become *C.* (*T.*) *quadrisulcatus* Demange, 1963 comb. n., *C.* (*T.*) *quadrisulcatus uncinulus* Demange, 1963 comb. n., *C.* (*T.*) *royi* Demange, 1963 comb. n., and *C.* (*T.*) *royi crucisulcatus* Demange, 1963 comb. n.

KEY WORDS: Chilopoda, Scolopendromorpha, Afrotropical, morphology, new synonymy, new combinations.

INTRODUCTION

Lawrence (1953) described two species of *Cryptops*: *C. loveridgei* from Tanzania and *C. kivuensis* from the Democratic Republic of the Congo. It is clear from his discussion of their relationships that Lawrence regarded these species as belonging to the subgenus *Cryptops* Leach, 1815. Examination of the type material as part of a study of this subgenus however, shows them to belong to subgenus *Trigonocryptops* Verhoeff, 1906. They are here described in detail, and the characters used to define *Trigonocryptops* and its validity are discussed. The subgenus *Paratrigonocryptops* Demange, 1963 is considered to be a junior synonym of *Trigonocryptops.*

Crabill (1960) pointed out that there is a lack of a uniform terminology for setae, spines and spurs and other armature of the centipede leg and body sclerites, and this is true of a number of other structures. Lewis *et al.* (in press) have proposed a standard terminology for the external taxonomic characters of the Scolopendromorpha. This is adopted in the following descriptions, but in order to avoid confusion, alternative terms in common use are given in parentheses.

The following acronyms are used:

MCZ – Museum of Comparative Zoology, Harvard University, Cambridge, USA.
MRAC – Musée Royal de l'Afrique Centrale, Tervuren, Belgium.

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TAXONOMY

Cryptops (*Trigonocryptops*) *loveridgei* Lawrence, 1953

Figs 1–13

Cryptops loveridgei Lawrence, 1953: 418, fig. 2. Four syntypes [47 mm, 40 mm, 38 mm and 35 mm], Tanzania: Tanganyika Territory, Mbara, near Lindi, 400 ft., iv.1939 (Arthur Loveridge). TC 675, (MCZ) [examined].

Cryptops (*Trigonocryptops*) *bokumensis* Kraus, 1958: 13, figs 6–11. Holotype ♂ and 8 paratypes, Democratic Republic of the Congo: Bokuma, vii.1952 (Lootens) (MRAC) [not examined]. **Syn. n.**

Diagnosis: Clypeal setose plate containing three large setae. Head paramedian sutures complete. Tergite paramedian sutures complete from segment 1. Anterior margin of forcipular coxosternum with five to seven setae on each side. Pores occupy anterior 90% of coxopleuron. Ultimate leg prefemur with dorsomedial spinous process and ventral longitudinal area lacking spiniform setae. Femur with dorsolateral apical spinous process. Tibia with dorsolateral and dorsomedial apical spinous processes.

Description of syntypes of *C. loveridgei*:

Maximum length 47 mm. Colour: brown. (Lawrence gave reddish yellow to reddish brown.)

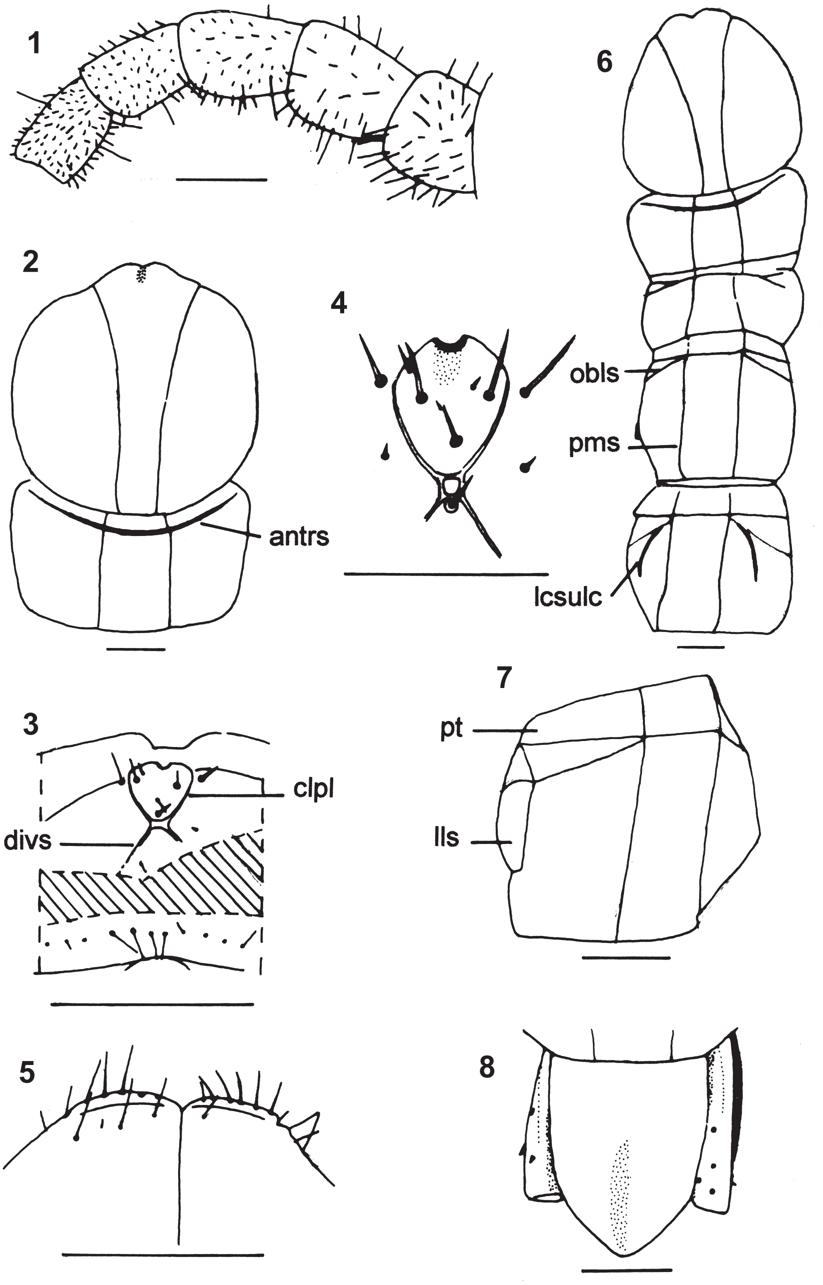
Antennae with 17+17 antennomeres. Antennomere I with long and medium setae; there is a gradual transition to antennomere V which has dense short setae and an irregular proximal whorl of long setae (Fig. 1).

Head plate as long as wide with complete anteriorly diverging paramedian sutures (Fig. 2). Posterior margin of head plate overlies anterior margin of T1, except in specimen 3 where they are not in contact.

Clypeus (Fig. 3) with anterior heart-shaped area ('plage en losange' of Brolemann 1926) here termed the setose clypeal plate with three large setae, two lateral and one posterior median, in addition two or three small setae. The plate is flanked by a seta on each side (Fig. 4). A pair of posterior diverging sutures, which do not reach the labrum, arise from the posterior apex of the plate. A large seta at the apex of these diverging sutures is present in specimen 3 but not in 2. Two small setae level with posterior end of plate and between these and the labrum five setae are arranged longitudinally, 1+2+2. A transverse row of 14 setae in front of the labrum in specimen 2, 17 in specimen 3.

Each side of anterior border of forcipular coxosternum bears a weakly convex ridge with five to seven long setae and with two or three setae lateral to the ridge on each side (Fig. 5). A median longitudinal suture occupies the anterior 30 to 46% of the coxosternum.

Tergite 1 with complete paramedian sutures continuing to anterior border of tergite but becoming very fine anterior to the anterior transverse suture (ring suture) (Fig 2). Tergites 2 to 4 or 5 with oblique (arcuate) sutures (Lawrence states indefinite on 2 and weak on 5). Paramedian sutures on tergites 2–20. Short lateral curved sulci (grooves) on tergite 4 (Fig. 6), occupying anterior two thirds of tergite from 6–9 or 6–20. Fine lateral longitudinal sutures clear and occupying anterior two-thirds of tergites and divided into anterior and posterior halves from 2–20 in specimen 1 (Fig. 7) but only on 1, 3 to 9, 14, 17 and 18 in specimen 2. Pretergites (intertergites) visible or not depending on state of contraction of the specimen so on 3–20 in specimens 1 and 2, only on 3, 4, 6, 13 and 14 in specimen 4. Posterior margin of tergite 21 triangular with rounded apex (Fig. 8). With numerous fringing setae in specimen 1, sparsely setose in



Figs 1–8. *Cryptops* (*T.*) *loveridgei*: (1) left antenna, basal five antennomeres, specimen 1, dorsal view; (2) head plate and tergite 1, specimen 1, *antrs* anterior transverse suture; (3) clypeus, specimen 2 (area obscured by forcipules is shaded), *clpl* setose clypeal plate, *divs* diverging suture; (4) setose clypeal plate, specimen 3; (5) anterior margin of forcipular coxosternum, specimen 1; (6) head plate and anterior four segments, specimen 2, *obls* oblique suture, *pms* paramedian suture, *lcsulc* lateral crescentic sulcus; (7) tergite 3, specimen 1, viewed obliquely, *pt* pretergite, *lls* lateral longitudinal suture; (8) tergite 21, specimen 2.

Scale bar = 0.5 mm except Fig. 4 = 0.25 mm.

specimens 2 and 4. With or without 1–3 spiniform setae on posterior border. A shallow median posterior longitudinal depression occupies 50–78% of tergite.

Sternites with crossed sulci or grooves ('Furchenkreuz') from segment 2 or 3 to 18 or 19. The transverse sulcus deep, the bottom of the groove dark brown, presumably due to transverse skeletal thickening or apodeme between the coxae. The ends of the sulcus are curved forwards on anterior segments (Fig. 9), but straight on posterior ones (Fig. 10). The median longitudinal sulcus forms a shallow trough, the posterior part disappearing on posterior segments.

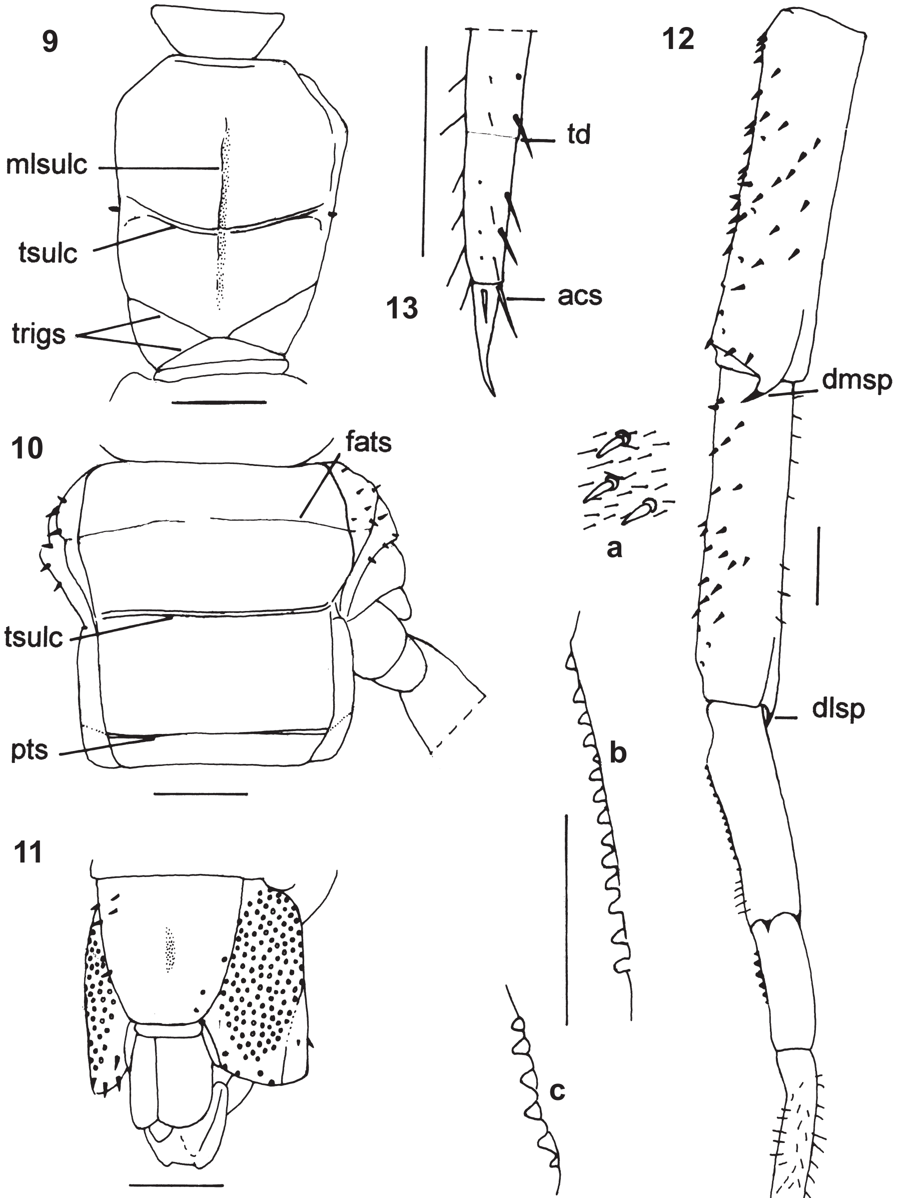
Endosternites clearly demarcated by a transverse groove or sulcus, this apparent on segments 3–17 in specimen 1 but only on 5 and 12, 13 and 14 in specimen 4 due to some telescoping of the trunk segments. (NB: the details of the endosternites were not observed as these large specimens were not cleared.)

The typical diagonal crossed sutures ('fissures en croix' of Brolemann 1926) forming three triangles just anterior to the endosternite (Fig. 9) present on segments 2 or 3–16 or 17 but only on 5–9 in specimen 4. Now termed trigonal sutures to avoid confusion with the crossed sulci, sometimes known as cruciform sulci, and in German, 'Furchenkreuz'. These trigonal sutures resolve into a posterior transverse suture on the more posterior tergites, seen only as a trace on segments 18 and 19 in specimen 3. In addition, some posterior sternites with a very fine anterior transverse suture about a quarter of the distance from the anterior margin of the sternite (Fig. 10).

Sternites punctate from 6 or 7 in specimen 1, from 10 in specimen 2, from 8 in specimen 3 but puncti not seen in specimen 4; tuberculate from 10 or 11 to 19, 20 or 21 in specimens 1, 2 and 4 (Lawrence states: fairly thickly and regularly covered with minute granules, more so on the posterior ones giving them a shagreened appearance). Tubercles absent in specimen 3. Tubercle detection crucially dependent on illumination. Sternites 17–20 with or without three or four spiniform setae on anterior corners and with four or five spiniform setae on the procoxae of the same segments. Sternite 21 a little wider than long with posterior margin rounded and moderately setose, with three or four lateral spiniform setae (Fig. 11), none in specimen 4.

With numerous small pores occupying the anterior 88–92% of the coxopleuron. Two or three spiniform setae behind pore field, none in specimen 2, four on posterior margin.

Two long and slender ultimate legs loose in tube; these could have come from any of the four specimens. One (Fig. 12) with prefemur with spiniform setae medial, ventral and lateral, a very narrow ventral longitudinal strip lacking these (Lawrence gives: with numerous black spine-like hairs below and at the sides, femur with similar but fewer spines) and with dorsomedial spinous process. Femur similar but with fewer spiniform setae and dorsolateral spinous process. Tibia with 14 small saw teeth (mucrones) (Lawrence gives: with a row of 12–14 minute serrate denticles below arranged in a slightly sigmoid curve and lateral and medial spinous processes). Tarsus I with six small saw teeth. All podomeres with moderately dense fine setae, more common dorsally on prefemur, longer on tarsus I. The second ultimate leg also with 14+6 saw teeth but prefemur with a more obvious ventral longitudinal spine-free strip. A number of terms have been used for what are here termed spinous processes, viz. Endzahn (Attems 1930; Kraus 1958), tubercles unciformes (Brolemann 1930), crochets (Demange 1963), and apical tooth and apical spine (Lawrence 1953).



Figs 9–13. *Cryptops* (*T.*) *loveridgei*: (9) sternite 5, specimen 2, *mlsulc* median longitudinal sulcus, *tsulc* transverse sulcus, *trigs* trigonal sutures; (10) sternite 18, specimen 4, *tsulc* transverse sulcus, *fats* fine anterior transverse suture, *pts* posterior transverse suture; (11) terminal segments, specimen 2, ventral view; (12) ultimate leg, fine setae not shown, *dmsp* dorsomedial spinous process, *dlsp* dorsolateral apical spinous process, **a** detail of setae on femur, **b** tibial saw teeth, **c** tarsal saw teeth; (13) tarsus of leg 11, specimen 1, *acs* anterior accessory spur, *td* division of tarsus. Scale bar = 0.5 mm.

Prefemora of legs 1–19 with spiniform setae on the anterior and ventral surfaces, distal only on posterior surface. These setae present on the ventral surface of the femora with a few distodorsally on the posterior surface. They are restricted to the ventral surface of the tibia. The spiniform setae occur in rows. Tarsus with fine setae and a few short setae ventrally, with a very faint division from leg 1 in specimens 1 and 2 (Fig. 13), very weak or absent in specimens 3 and 4. Two accessory spurs (claw spines), the anterior being the longer. Leg 19 densely setose ventrally on prefemur, femur and tibia. Leg 20 with spiniform setae on dorsal, posterior and ventral surfaces. Tibia and tarsus without spiniform setae. Fine setae occur densely on the ventral surface of prefemur, very densely on the ventral surface of femur and all surfaces of the tibia, less so on the tarsus.

Katopleure divided vertically. Spiracles elongated horizontally.

Remarks: Lawrence (1953) stated that *C. loveridgei* agrees well with *Cryptops aloysiisabaudiae* Silvestri, 1907 (from Ruwenzori Mountains, Uganda), except in the structure of the porose area and the dentition of the ultimate legs, but this is not the case as *C. aloysiisabaudiae* does not appear to be a *Trigonocryptops.* It is, moreover, only 12 mm long and may be a juvenile. It needs to be re-examined.

In Demange's (1968) key to the African species of *Trigonocryptops, C. loveridgei* runs down to *C. bottegii bottegii* Silvestri, 1886 (Demange 'rectified' the specific name to *C. bottegoi*) from Kenya, and *S. bokumensis* Kraus, 1958, from the east of the Democratic Republic of the Congo. The species were not separated in the key. Characterised by the presence of paramedian sutures on tergite 1 and of the ultimate leg prefemora with a single apical spinous process, they may be separated by the number of setae on the anterior margin of the forcipular coxosternum viz. 14+14 in *C. b. bottegii* and 7+7 in *C. bokumensis*.

Cryptops loveridgei and *C. bokumensis* are very similar. The latter is characterised by smooth tergites and sternites. However, although three of the syntypes of *C. loveridgei* have tuberculate posterior tergites, one does not. The tubercles are difficult to see and easily overlooked.

Cryptops (*T.*) *bokumensis* is here regarded as a junior synonym of *C.* (*T.*) *loverigei.*

Cryptops (*Trigonocryptops*) *kivuensis* Lawrence, 1953

Figs 14–21

C. kivuensis Lawrence, 1953: 419. Holotype, Democratic Republic of the Congo, Idjwi Id., Lake Kivu, ii.1939 (A. Loveridge), TC-674, unique number 14389, MCZ [examined].

Diagnosis: Setose clypeal plate bearing ten large setae. Head paramedian sutures complete. Tergite 1 lacks paramedian sutures, these incomplete on segment 2 and 3, complete on 4. Anterior margin of forcipular coxosternum with 5–6 setae on each side. Pores occupy anterior 90% of coxopleuron. Ultimate leg prefemur with dorsomedial spinous process and ventral longitudinal area lacking spiniform setae. Femur with dorsolateral apical spinous process. Tibia with dorsolateral and dorsomedial apical spinous processes.

Description of holotype:

Length approximately 30 mm. Colour brown.

Antennae with 17+14 antennomeres, the basal two antennomeres with long setae, the third with medium and short, the subsequent with short fine setae and an irregular proximal whorl of long setae.

Head plate as long as wide with complete, anteriorly diverging paramedian sutures (Lawrence gives: with very faint furrows in its posterior two-fifths). Posterior margin of head plate overlies anterior margin of tergite 1 (Fig. 14).

Clypeus, which is partially obscured, with indistinct anterior heart-shaped setose clypeal plate with about ten setae, some represented only by sockets (Fig. 15)

Anterior border of forcipular coxosternum slightly curved on each side with 6+4 long setae some represented only by their sockets on the sclerotised ridge (Fig. 16). With 3+3 lateral setae (Lawrence gives: anterior margin with 3 or 4 long bristles). A prominent seta behind the anterior margin on each side and a very weak median longitudinal suture occupying the anterior 45% of the coxosternum.

Tergite 1 with anterior transverse suture (not mentioned by Lawrence) obscured by posterior margin of head capsule (Fig. 14) and without paramedian sutures. Very fine oblique sutures on 2–5, these very difficult to make out. Paramedian sutures incomplete on tergites 2 and 3, complete on tergites 4–20. Lateral crescentic sulci (grooves) on tergite 5–19. No lateral longitudinal sutures. Pretergites visible on 2–20. Tergite 21 without median depression or spiniform setae.

Sternites with deeply grooved transverse sulcus (groove) from 3–19, the median longitudinal sulci scarcely visible, their appearance depending very much on correct illumination (Lawrence gives: sternites with cross furrows, the longitudinal ones definitely longer than the transverse ones). Trigonal sutures on sternites 3–8 (Fig. 17) (sternites 1 and 2 obscured), becoming a transverse curved suture from 9 and then straight (Fig. 18). Sternites punctate from 5, without tubercles. Sternite 20 with one or two stout setae antero-laterally, also on precoxa 19 and 20. Sternite 21 with sides converging posteriorly, and posterior margin slightly concave and lacking spiniform setae (Fig. 19).

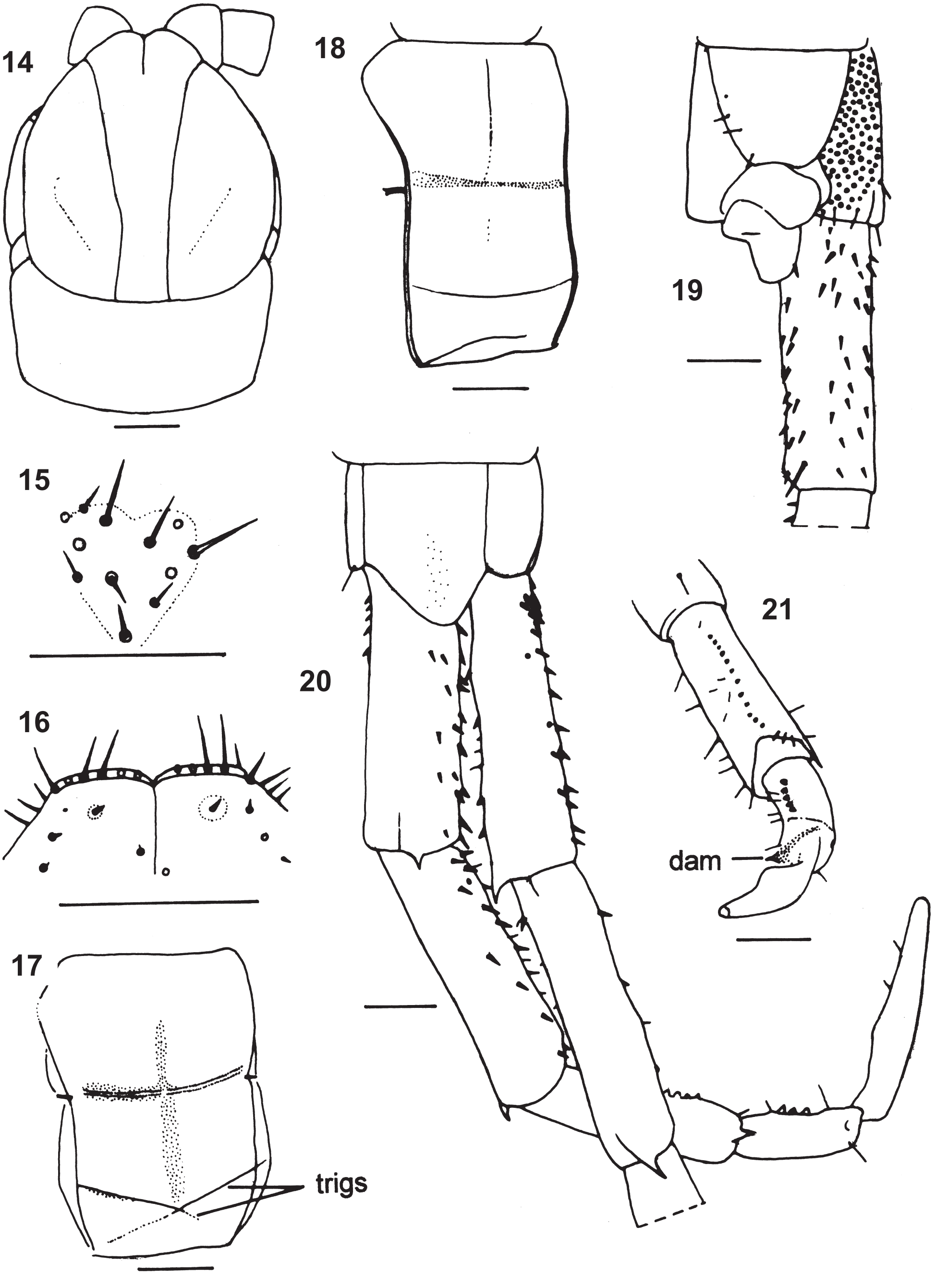
Numerous small pores occupying the anterior 88% of coxopleuron, with four setae on or anterior to posterior margin.

Ultimate legs long. Prefemur with dorsomedial apical spinous process, femur with dorsolateral and tibia with dorsolateral and dorsomedial apical spinous processes (Fig. 20). Both second tarsi damaged. Prefemur with short spiniform setae, these absent dorsally and from median longitudinal ventral strip (Fig. 19). Femur with spinous setae on posterior (inner) surface, a few on anterior (outer) on left femur. A few long fine setae on all podomeres. Tibia with 11 or 12 small saw teeth (mucrones) ventrally in a sinuous row (Fig. 21). Tarsus 1 with 3 or 5 larger saw teeth.

Many of legs 1–19 are missing and mqny of those still attached lack terminal claws, some lack tarsi. Prefemur with spiniform setae anteriorly and ventrally, and a few occur posteriorly and dorsally. Femur with spiniform setae ventrally and a few anteriorly and posteriorly; ventrally only on the tibia. The tarsi very weakly divided, accessory spurs two, the anterior the longer (Lawrence gives: legs well provided with strong setae, those on the 13th pair to the ultimate legs strong and spine-like, especially on the prefemur and femur, where they form irregular rows). Leg 20 with spiniform setae dorsally, posteriorly and ventrally on prefemur, posteriorly and ventrally on femur, which is densely setose on its anterior face; tibia with spiniform setae ventrally.

Spiracles not visible.

Remarks: Lawrence (1953) stated that *C. kivuensis* agrees most closely with *C. stupendus* Attems, 1928, but this was due to the fact that he overlooked its anterior transverse and



Figs. 14–21. *Cryptops* (*T.*) *kivuensis*, holotype: (14) head plate and first tergite; (15) setose clypeal plate; (16) anterior margin of forcipular coxosternum; (17) sternite 8, *trigs* trigonal sutures; (18) sternite 11; (19) terminal segments and prefemur of left ultimate leg, ventral; (20) terminal segments and ultimate legs, dorsal; (21) tibia and tarsus of left ultimate leg, *dam* damaged area of tarsus 1. Scale bar = 0.5 mm, except Fig. 15 = 0.25 mm.

trigonal sutures. It runs down to *C.* (*T.*) *numidicus tropicus* Attems, 1909, recorded from three localities in Kenya, in Demange's (1968) key. This species, is, however, smaller (18 mm) and has only 7+3 saw teeth (mucrones) on the ultimate leg tibia and tarsus rather than the (11 or 12) + (3 or 5) in *C. kivuensis* and the coxal pores occupy a restricted area on the coxopleuron rather than 90%.

DISCUSSION

The genus *Cryptops* comprises six subgenera, namely *Cryptops* Leach, 1815, *Trigonocryptops* Verhoeff, 1906 (type sp. *C. gigas* Kraepelin, 1903), *Chromatanops* Verhoeff, 1906 (type sp. *C. bivittatus* Pocock, 1893), *Haplocryptops* Verhoeff, 1934, *Trichocryptops* Verhoeff, 1937, and *Paratrigonocryptops* Demange, 1963.

Verhoeff (1906) characterised *Trigonocryptops,* which he described as a separate genus, as having all legs with divided tarsi, paratergites clearly delimited, and the clypeus delimited by a triangular suture. Also the trunk segments with endosternites clearly delimited by the triangular sutures here termed trigonal sutures ('vom ein dreieckiges Feld vorlagert. Vor diesem Hinterdreieck befinden sich zwei seitliche Dreiecke') and with a well-developed tubercle on each side of the endosternite. The spiracles are slit-like, the katopleure divided, and pigment masses are absent.

Attems (1930) regarded *Trigonocryptops* as a subgenus of *Cryptops,* giving Verhoeff's characters of the trigonal sutures and divided katopleure, but he considered the tarsi to be only more or less divided, sometimes not. He added that the sternites have a transverse ridge between the coxae, and that the head overlies tergite 1 and nearly always has a 'Ringfurche' (anterior transverse suture), but these are characters shared with some other *Cryptops* species.

The subgenus *Paratrigonocryptops* is very similar to *Trigonocryptops.* Both have endosternites clearly delimited but *Paratrigonocryptops* lacks trigonal sutures, the endosternite being delimited by a transverse groove. Both have the posterior margin of the head plate overlying the anterior margin of tergite 1, an anterior transverse suture (ring sulcus) on tergite 1, and a sternital transverse apodeme present between the coxae, although these characteristics are shared with some species of other subgenera. The two subgenera further have in common the spinous processes (teeth) on the prefemur, femur and tibia of the ultimate leg. An exception is *C. jheringi* Brölemann, 1902, regarded by Attems (1930) as a member of the subgenus *Trigonocryptops*, but this may not be the case. Several species of *Cryptops* (*Cryptops*) also share this character. The clypeus circumscribed by a triangular suture, which Verhoeff (1906) regarded as a characteristic of *Trigonocryptops,* is also seen in *Paratrigonocryptops*, although not in all specimens. This suture and the clypeal setose plate ('plage en losange') are, as far as I am aware, only found in these two subgenera. The trigonal sutures can be very poorly developed and I consider the species of Demange's (1963) subgenus *Paratrigonocryptops* to be *Trigonocryptops* species in which they are not expressed. *Paratrigonocryptops* is here regarded as a junior synonym of *Trigonocryptops.* The two species and two subspecies of *Paratrigonocryptops* thus become *C.* (*T.*) *quadrisulcatus* Demange, 1963 comb. n., *C.* (*T.*) *quadrisulcatus uncinulus* Demange, 1963 comb. n., *C.* (*T.*) *royi* Demange, 1963 comb. n., and *C.* (*T.*) *royi crucisulcatus* Demange, 1963 comb. n.

As implied by Attems (1930), divided tarsi is not a consistent character. This was observed to be the case in *Cryptops* (*C.*) *doriae* Pocock, 1891, by Lewis (1999), who wrote 'in the majority of specimens the tarsi of most legs are divided. In some specimens this is obvious … in other specimens the division is very feint [sic].' Lewis quoted Eason (*pers. comm.*) who wrote of Lithobiomorpha 'the trouble with divided tarsi is that in some species it is very difficult to decide whether they are divided or fused. I would certainly be inclined to dismiss this character unless it is associated with other characters or geographical range'.

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